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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,036	09/12/2002	Yudong Zhu	122235	9589

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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NISKAYUNA, NY 12309

EXAMINER

FETZNER, TIFFANY A

ART UNIT	PAPER NUMBER
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2859

DATE MAILED: 03/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/065,036

Applicant(s)

ZHU ET AL.

Examiner

Tiffany A. Fetzner

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8-15 and 17-39 is/are pending in the application.
- 4a) Of the above claim(s) 1-6,8 and 27-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-15,17-26 and 32-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-6,8-15 and 17-39 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/21/2004 Figs 1-3 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 09/23/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED Non-final ACTION

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Drawings

2. Figure 4 is still objected to by the examiner, because a replacement-drawing sheet for figure 4 was not filed. Applicant filed a replacement-drawing sheet for figure 1 on sheet 1 of 3, and two copies of the replacement-drawing sheet for figures 2 and 3 on sheet 2 of 3, **A replacement drawing sheet for figure 4 on sheet 4 of 3**, was never filed.

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

Replacement Drawing Sheets

Drawing changes must be made by presenting replacement figures which incorporate the desired changes and which comply with 37 CFR 1.84. An explanation of the changes made must be presented either in the drawing amendments, or remarks, section of the amendment. Any replacement drawing sheet must be identified in the top margin as "Replacement Sheet" (37 CFR 1.121(d)) and include all of the figures appearing on the immediate prior version of the sheet, even though only one figure may be amended. The figure or figure number of the amended drawing(s) must not be labeled as "amended." If the changes to the drawing figure(s) are not accepted by the examiner, applicant will be notified of any required corrective action in the next Office action. No further drawing submission will be required, unless applicant is notified.

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Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and centered within the top margin.

Annotated Drawing Sheets

A marked-up copy of any amended drawing figure, including annotations indicating the changes made, may be submitted or required by the examiner. The annotated drawing sheets must be clearly labeled as "Annotated Marked-up Drawings" and accompany the replacement sheets.

Timing of Corrections

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.85(a). Failure to take corrective action within the set period will result in ABANDONMENT of the application.

If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings **MUST** be filed within the **THREE MONTH** shortened statutory period set for reply in the "Notice of Allowability." Extensions of time may **NOT** be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability.

Election/Restriction (maintained Group 1 provisionally withdrawn)

Group 1. **Claims 1-6, 8 and 27-31**, drawn to an imaging apparatus for producing a magnetic resonance image of a subject, classified in class 324 subclass 318.

Group 2. **Claims 9-15, 17-26 and 32-39**, drawn to a method for producing an image from an extended volume of interest within a subject using a magnetic resonance imaging (MRI) system where the extended volume of interest is larger than an

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imaging portion of a magnet within the MRI system, classified in class 324, subclass 309.

The inventions are distinct, each from the other because of the following reasons:

3. Inventions of Group 1 and Group 2 are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because Group 1 is drawn to any magnetic resonance apparatus that is capable of producing an image, and does not require the main feature of Group 2, that the image produced is of an extended field of view. Group 1 encompasses every MRI apparatus which is functional to produce an image, and is not restricted to an extended field of view therefore criteria (1) is satisfied. The subcombination has separate utility such as the ability to image a volume of interest that is larger than a portion of the conventional MR magnet, which distinguishes the method of Group 2 from the generic apparatus of Group 1, therefore criteria (2) is satisfied.

4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

5. Because these inventions are distinct for the reasons given above and the search required for Group 1 is not required for Group 2, restriction for examination purposes as indicated is proper.

6. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

7. During a telephone conversation with Attorney **Jean K. Testa Reg. No. 39,396** on September 14th 2004 a provisional election was made **without traverse** to prosecute the invention of **Group 2, claims 9-15, 17-26 and 32-39** Affirmation of this election must be made by applicant in replying to this Office action. **Claims 1-6, 8, and 27-31**

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are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

8. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

9. The examiner notes that applicant still needs to formally elect the claims of group 2 by canceling the claims of **group 1. The response of December 21st 2004 failed to state an actual election of group 2 as required.** The examiner notes that while the **group 1** claims are indicated in the December 21st 2004 response to be withdrawn that no actual election has been made. **Also applicant's December 21st 2004 response mistakenly indicates that claim 26 has been withdrawn,** but it is the examiner's understanding that **claim 26 is still a pending claim** because it is part of provisionally elected group 2.

Canceled claims

10. The examiner notes that originally dependent **claims 7, and 16,** were added into the independent claims by the December 10th 2003 amendment, and that **original dependent claims of 7 and 16 have been cancelled,** as per applicant's December 10th 2003 amendment and response.

Response to Arguments

11. Applicant's arguments filed **December 21st 2004** have been fully considered but they are not persuasive. Applicant's arguments, see remarks pages 8-10 of the amendment and response, filed **December 21st 2004,** with respect to the rejection(s) of **claims 9-15, 17-26 and 32-39 under 35 USC § 103 (a)** as being unpatentable over **Hajnal** US patent 6,385,478 issued May 7th 2002, filed December 21st 1999; in view of **Pelc et al.,** US patent 6,445,181 B1 issued September 3rd 2002, filed November 9th 2000, have been fully considered and are **not persuasive,** because these reference do teach the features required by the claims of the December 21st 2004 response which applicant alleges to be missing from these references.

12. Specifically, the examiner notes that contrary to applicant's arguments on page 8 last paragraph through page 9 paragraph 4, of the December 21st 2004 response, **Hajnal** does teach the feature of "*receivers that are adapted to adjust a receiver parameter*", because **Hajnal** teaches with respect to figure 8 and col. 6 lines 34-42 that successive frequency offsets could be applied to the frequency of the rf. (i.e. the rf. excitation) pulse so that the data from the four different A, B, C, D, slices are collected individually. **Hajnal** also teaches adjusting the receiver phase, which is a receiver parameter because a phase correction is applied to each detected / received signal sample point. [See **Hajnal** col. 5 lines 30-44; col. 6 lines 63-65; where the phase correction, to account for the speed / velocity of the continuously moving patient table is performed along in the z-axis direction, that according to the **Hajnal** coordinate system of figures 1, 3, and 4 is the direction of the image, and a direction parallel to the motion of the subject.]

13. Additionally, **Pelc et al.**, explicitly teaches the feature of "receivers that are adapted to adjust a receiver parameter", and also teaches this step occurring during the actual scanning process. [See **Pelc et al.**, the last sentence of the abstract and col. 4 lines 50-65, where the detected (i.e. received) NMR signal is corrected by applying a phase shift of $-kz\Delta z$ (i.e. phase shift is a receiver parameter) to each raw data sample either numerically during image reconstruction or applied during the scan itself. This correction of **Pelc et al.**, is applied by introducing a phase shift (i.e. a receiver parameter adjustment) into the receiver 18. The correction is also applied during the scanning process by altering the frequency of signal (i.e. frequency is also a receiver parameter) used for demodulation in the receiver. Therefore the **Pelc et al.**, receivers are adapted to adjust one or more parameters which include both the phase and frequency of the received / detected signals. The fact that the demodulation frequency (i.e. another receiver parameter) is taught to be adjustable also implies that transmit / receiver coil component 26 of **Pelc et al.**, col. 2 lines 51-58, is also capable of adjusting the excitation frequency, along with the reception frequency because an adjustment in the demodulation frequency intrinsically affects both the excitation and reception frequency of transmit / receive coil 26.]

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14. The examiner still agrees however that the features added by the July 1st 2004 RCE amendment are not present in the applied **Machida** US patent application publication 2002/0115929 A1 published August 22nd 2002; with an effective filing date of September 21st 2001; or the **Wang et al.**, US patent 5,928, 148 issued July 27th 1999 references. Therefore, these rejections from earlier office actions are still withdrawn.

15. **The rejection of claims 9-15, 17-26 and 32-39 under 35 USC § 103 (a)** as being unpatentable over **Brittain** US patent application publication 2002/0140423 A1 published October 3rd 2002; with an effective filing date of October 5th 2001; in view of **Pelc et al.**, US patent 6,445,181 B1 issued September 3rd 2002, filed November 9th 2000, from the last office action **are rescinded** in view of applicant's statement in the December 21st 2004 response on page 8 the second to last paragraph that: "the **Brittain** reference should be disqualified as prior art pursuant to **35 USC §103 (c)** since the **Brittain** reference (now US patent 6,794,869) and Applicants' invention were at the time of applicant's invention was made, owned by General Electric Company. Therefore the rejection under **35 USC § 103 (a)** over the **Brittain** and **Pelc et al.**, references is obviated.", which invokes the exception of **35 USC §103 (c)**.

Double Patenting

16. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

17. A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

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18. Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

19. **Withdrawn but still pending**, (i.e. due to lack of cancellation by applicant) **claim 1**, is rejected under the judicially created doctrine of double patenting over **patented claim 1** of **Dumoulin et al.**, U. S. Patent No. 6,584,337 B2 since the claim, if allowed, would improperly extend the "right to exclude" already granted in the patent.

20. **Claims 9**, and **15** of the instant application are rejected under the judicially created doctrine of double patenting over **patented claims 6**, and **7** of **Dumoulin et al.**, U. S. Patent No. 6,584,337 B2 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.

21. The subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent since the patent and the application are claiming common subject matter, as follows:

A) Claim 1 of **Dumoulin et al.**, U. S. Patent No. 6,584,337 B2 and applicant's withdrawn but still pending claim 1, of the instant application are equivalent, corresponding claims.

B) Claim 6 of **Dumoulin et al.**, U. S. Patent No. 6,584,337 B2 and applicant's pending **claim 9**, of the instant application are functionally equivalent, corresponding claims, which comprise the same method steps. The examiner notes that in method claims all features are granted full patentable weight regardless of whether a feature is in the body or preamble of a claim. Therefore **claim 6** of **Dumoulin et al.**, U. S. Patent No. 6,584,337 B2 and applicant's currently pending **claim 9**, of the instant application due correspond to one another and are functionally equivalent, claims.

C) Claim 7 of **Dumoulin et al.**, U. S. Patent No. 6,584,337 B2 and applicant's pending **claim 15**, of the instant application are functionally equivalent, corresponding claims.

22. Furthermore, there is no apparent reason why applicant was prevented from presenting claims corresponding to those of the instant application during prosecution of

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the application, which matured into a patent. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Claim Rejections - 35 USC § 103

23. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

24. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

25. **Claims 9-15, 17-26 and 32-39** are also rejected under **35 U.S.C. 103(a)** as being unpatentable over **Hajnal** US patent 6,385,478 issued May 7th 2002, filed December 21st 1999; in view of **Pelc et al.**, US patent 6,445,181 B1 issued September 3rd 2002, filed November 9th 2000,

26. With respect to **Amended Method claim 9**, **Hajnal** teaches and / or shows "A method for producing an image from an extended volume of interest within a subject using a Magnetic Resonance Imaging (MRI) system where the extended volume of interest is larger than an imaging portion of a magnet within the MRI system", {See abstract, col. 2 lines 29-32} "the method comprising: translating the volume using a positioning device" [See figures 1-3, 9 where the motor component 6 controls and moves the patient table / couch / bed / platform / support] "along an axis of the MRI system for imaging portions of the volume when they are within the imaging portion of the magnet;" {See Figures 1-3 and figure 9; abstract; col. 3 lines 38-55}

27. **Hajnal** also teaches and suggests the step of "detecting a plurality of MR signals from at least one radio frequency (RF) coil array (i.e. component 10) for a given field-of-

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view within the MRI system as the positioning device is translating the volume;" {See Figures 1-3, 9, 7c col. 5 line 28 through col. 6 line 19}

28. Additionally, the examiner notes that the RF coil assembly of **Hajnal** is an RF coil assembly which comprises at least two RF coils coil 9 for RF transmission and coil 10 for reception. [See col. 3 line 62 through col. 4 line 3] **Hajnal** also teaches that the receive coil 10 is adapted to adjust a receiver parameter;" (i.e. see the explanation in the response to arguments section above concerning this feature) [See also **Hajnal** col. 5 line 30 through col. 6 line 65] "wherein the receiver parameter" (i.e. the phase of each received signal) "is adjusted" (i.e. corrected) "based on direction of the image parallel to a motion of the subject" (i.e. the received acquired k-space signals are adjusted to account for motion along (i.e. "parallel to") the z imaging axis" [See **Hajnal** figures 1, 3, and 4] which is the axis of continuous patient motion, with the data then being sorted and re-aligned to match z locations, (i.e. directions of the image which are parallel to a motion of the subject along the z-axis.) [See **Hajnal** page 5 line 28 through col. 7 line 25].

29. **Hajnal** also teaches and / or shows "computing a plurality of respective sub-images" (i.e. a series of acquisition positions) {See col. 5 line 30 through col. 7 line 26, especially col. 6 lines 6-18, where multiple sub-images comprise a continuous seamless length of time 3D image data, "corresponding to the plurality MR signals for the" receiver(s) of the RF coil assembly, "and for the given field-of-view (FOV) at a plurality of incremented locations of the subject; [See col. 5 line 30 through col. 7 line 26,].

30. Additionally, **Hajnal** also teaches "combining the plurality of respective sub-images to form a composite image of the volume of interest" [See col. 6 line 6 through col. 7 line 25]. The limitation of "wherein the combining comprises combining a central portion of each sub-image to form the composite image" is taught and suggested by **Hajnal** [See col. 6 lines 19-43].

31. **Hajnal** lacks directly teaching that there are explicitly "a plurality of receivers" configured in adjust the receiver parameter with the exact terminology of "based on a direction of the image parallel to a motion of the subject". However **Hajnal** teaches a multi-slice imaging technique, [See col. 6 line 66 through col. 7 line 25] "which may use

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at least one RF coil assembly, (i.e. RF coils 9 and 10 comprise the coil assembly and do constitute an at least two RF coil plurality) for imaging a plurality of regions while the object is continuously moved, with the acquired data being aligned and matched to locations in a direction parallel to the z-axis direction of table motion. [See **Hajnal** col. 3 line 38 through col. 7 line 25; especially col. 5 lines 1-5; and col. 5 line 30 through col. 6 line 65, which does suggest applicant's terminology of "based on a direction of the image parallel to a motion of the subject.

32. Alternatively, **Pelc et al.**, explicitly teaches the feature of "receivers" [See **Pelc et al.**, col. 2 lines 54-68] that are adapted to adjust a receiver parameter", and also teaches this step occurring during the actual scanning process. [See **Pelc et al.**, the last sentence of the abstract and col. 4 lines 50-65, where the detected (i.e. received) NMR signal is corrected by applying a phase shift of $-kz\Delta z$ (i.e. phase shift is a receiver parameter) to each raw data sample either numerically during image reconstruction or applied during the scan itself. This correction of **Pelc et al.**, is applied by introducing a phase shift (i.e. a receiver parameter adjustment) into the receiver 18. The correction is also applied during the scanning process by altering the frequency of signal (i.e. frequency is also a receiver parameter) used for demodulation in the receiver. Therefore the **Pelc et al.**, receivers are adapted to adjust one or more parameters which include both the phase and frequency of the received / detected signals. The fact that the demodulation frequency (i.e. another receiver parameter) is taught to be adjustable also implies that transmit / receiver coil component 26 of **Pelc et al.**, col. 2 lines 51-58, is also capable of adjusting the excitation frequency, along with the reception frequency because an adjustment in the demodulation frequency intrinsically affects both the excitation and reception frequency of transmit / receive coil 26.]

33. Additionally, it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify and / or combine the RF coil assembly teaching of **Hajnal** to include a "a plurality of receivers" in a configuration as shown by **Pelc et al.**, Figure 1 because the **Hajnal** reference specifically teaches using a series of frequency offsets for the different data volumes A, B, C, D with multi-sequence echo imaging, and is well known from **Pelc et al.**, that an array of four reception coils, which

has each coil tuned to a separate frequency, permits four times more signal data to be acquired in a single scan, as opposed to the method of **Hajnal** which requires having to re-adjust the frequency of a single coil, for each new A, B, C, D, volume. The examiner also notes that simply increasing the number of reception coils is **not** a novel, non-obvious modification, because substituting an array of coils for a single coil; or a single coil for a plurality of coils, has been performed for well over a decade as per the **Pelc et al.**, citation of US patent 4,825,162 from **Pelc et al.**, col. 2 lines 59-63] and would have been a readily obvious modification to an individual of ordinary skill in the MRI / NMR art, because increased data acquisition with a minimal or no increase in acquisition time is highly desirable.

34. With respect to **Amended Method claim 18**, **Hajnal** teaches and / or shows "A method for imaging an extended volume of interest within a subject using a Magnetic Resonance Imaging (MRI) system comprising: translating the subject into an imaging portion of a magnet assembly of the MRI system; detecting a plurality of MR signals from a radio frequency (RF) coil array;" and, sending the plurality of MR signals "to a" receiver assembly, (i.e. RF coils 9 and 10 in combination) with the receiver being adapted to adjust a receiver parameter; wherein the receiver parameter is adjusted based on direction of the image parallel to a motion of the subject" (i.e. the received acquired k-space signals are adjusted to account for motion along (i.e. "parallel to") the z imaging axis which is the axis of continuous patient motion, with the data then being sorted and aligned to match anatomic z locations, (i.e. directions of the image which are parallel to a motion of the subject.)) [See **Hajnal** Figures 1-9, abstract, col. 2 line 19 through col. 7 line 25] for the same reasons as noted in the rejection of **claim 9**, above, which need not be reiterated.

35. **Hajnal** teaches and / or shows the step of "reconstructing at least one image of the volume of interest by computing a plurality of respective sub-images corresponding to the plurality MR signals" from the receiver "and for the given field-of-view (FOV) at a plurality of incremented locations of the subject as the subject is translated and combining the plurality of respective sub-images to form a composite image of the volume of interest" (i.e. a image of a patients abdomen). [See Figures 1-9 col. 2 line 19

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through col. 7 line 25]. The limitation of "wherein the combining comprises combining a central portion of each sub-image to form the composite image" is also taught by

Hajnal, see col. 6 lines 19-43, in combination with col. 5 line 1 through col. 7 line 25.

36. **Hajnal** lacks directly teaching that there are explicitly "a plurality of receivers" configured in adjust the receiver parameter with the exact terminology of "based on a direction of the image parallel to a motion of the subject", as mentioned in the rejection of **claim 9**, above. However, this feature is also suggested by **Hajnal** and/or the combination of the **Hajnal**, and **Pelc et al.**, references for the same reason as those given in the rejection of **claim 9** which need not be reiterated. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claim 9** also apply to **claim 18** and need not be reiterated.

37. With respect to method **claim 10**, and **corresponding method claim 21**, which depend respectively from amended **independent method claims 9**, and **18**; **Hajnal** suggests and shows that "the at least one RF coil array is mounted on a fixture that is disposed about the subject. {See RF coil reception assembly 9, 10 col. 3 line 38 through col. 4 line 3; and figures 1-3, 9}. Alternatively **Pelc et al.**, directly teaches this limitation. [See **Pelc et al.**, col. 3 lines 10-20 and col. 3 lines 36-36.] The same reasons for rejection, obviousness, and motivation to combine, which apply to **claims 9**, and **18** also apply to **claims 10**, and **21**.

38. With respect to method **claim 11**, and **corresponding method claim 22**, which depend respectively from amended **independent method claims 9**, and **18**; **Hajnal** teaches and suggests from figures 1-3 and 9 that "the fixture and RF coil array mounted thereon are stationary relative to the static magnetic field." {See Figures 1-3, 9 col. 3 line 38 through col. 7 line 25} Alternatively **Pelc et al.**, directly teaches this limitation. [See **Pelc et al.**, col. 3 lines 10-20.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, **10**, **18**, and **21** also apply to **claims 11** and **22**.

39. With respect to method **claim 12**, and **corresponding method claim 23**, which depend respectively from amended **independent method claims 9**, and **18**; **Hajnal** lacks directly teaching that "the fixture and RF coil array mounted thereon are moveable

relative to the static magnetic field.” However, **Pelc et al.**, teaches that this limitation is an alternative configuration for a plurality of reception coils. {See abstract, figure 1; col. 2 line 4 through col. 4 line 65} Therefore, because the substitution of a plurality of receiver coils for a single receiver coil is well known, {See the rejection of **claims 9, 18**} the modification taught by **Pelc et al.**, when using a plurality of reception coils would also have been obvious to one of ordinary skill in the art at the time that the invention of **Hajnal** was made. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims, 9, 10, 18, and 21** also apply to **claims 12 and 23**.

40. With respect to method **claim 13**, and **corresponding method claim 20**, which depend respectively from amended **independent method claims 9, and 18; Hajnal and Pelc et al.**, show “the at least one rf coil array comprises a plurality of coil elements arranged in a orthogonal distribution relative to a frequency encoding direction” {See Rf coils 9,10 and Figures 1-3, 9 of **Hajnal**, with col. 3 line 38 through col. 7 line 25 of **Hajnal**, and/or figure 3 of **Pelc et al.**, with the **Pelc et al.**, abstract, col. 1 line 65 through col. 4 line 65]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9, and 18** also apply to **claims 13 and 20**.

41. With respect to method **claim 14**, and **corresponding method claim 24**, which depend respectively from amended **independent method claims 9, and 18; Hajnal** teaches that “at least one rf coil array detects the MR signals concurrently with the translation of the positioning device”. [See **Hajnal** col. 5 line 1 through col. 7 line 25; and additionally see the entire **Pelc et al.**, reference.] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9, and 18** also apply to **claims 14 and 24**.

42. With respect to **method claim 15**, and **corresponding method claims 25**, which depend respectively from **independent method claim 9, and independent method claim 18; Hajnal** teaches and shows that “the translating step is repeated until a selected length of the subject has been imaged inside the imaging portion of the magnet.” {See col. 5 line 28 through col. 57 line 25]. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9, and 18** also apply to **claims 15 and 25**.

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43. With respect to **method claim 17**, and **corresponding method claims 19**, which depend respectively from **independent method claim 9**, and **independent method claim 18**; **Hajnal** suggests that "the extended volume of interest" acquires slices as the patient is translated into the MR device in a "head-to-toe" direction, because the slices are acquired sequentially from z1 through z4 for volumes A, B, C, D therefore using the **Hajnal** apparatus a patient inserted into the imaging bore head first will intrinsically be imaged in a head-to-toe manner, while a patient inserted into the imaging bore feet first will intrinsically be imaged in a "toe-to-head" manner. [See Figures 1-3, 9; abstract, col. 2 line 19 through col. 7 line 25. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, and **18** also apply to **claims 17** and **19**.

44. With respect to **method claim 26**, **Hajnal** teaches that "the translating step is substantially continuous". [See col. 5 line 1 through col. 7 line 25, abstract] The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, and **18** also apply to **claim 26**.

45. With respect to **method claim 32**, and **corresponding method claims 36**, which depend respectively from **independent method claim 9**, and **independent method claim 18**; **Hajnal** teaches and shows that "the receiver parameter comprises a receiver frequency, (i.e. the Larmour resonance frequency [See col. 1 lines 5-28]) "and wherein the receiver frequency is adjusted in response to a translation of the positioning device," [See col. 6 lines 19-65] "wherein the receiver frequency is adjusted when a frequency encoding direction of the image is parallel to an axis of a motion of the subject", so that different imaging volumes can be collected in the direction of patient motion. [See col. 5 line 1 through col. 7 line 25] where the data is re-aligned and frequency adjusted to match z locations in the same direction (i.e. parallel to the axis of patient table motion)]. The examiner also notes that the **Pelc et al.**, reference also teaches and suggests this limitation for the same reasons given in the response to arguments section above. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, and **18** also apply to **claims 32** and **36**.

46. With respect to **method claim 33**, and **corresponding method claims 37**, which depend respectively from **independent method claim 9**, and **independent method claim 18**; **Hajnal** teaches and shows that "the receiver parameter comprises a receiver phase, and wherein the receiver phase is adjusted in response to a translation of the positioning device; wherein the receiver phase is adjusted when a phase encoding direction of the image is parallel to an axis of a motion of the subject". [See col. 6 line 51 through col. 7 line 25; where the receiver phase encodes different locations with different orderings when motion in the table direction is continuous.] The examiner also notes that the **Pelc et al.**, reference also teaches and suggests this limitation for the same reasons given in the response to arguments section above. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, and **18** also apply to **claims 33** and **37**.

47. With respect to **method claim 34**, and **corresponding method claims 38**, which depend respectively from **independent method claim 9**, and **independent method claim 18**; **Hajnal** teaches and shows that "the rf coil array is configured to adjust a transmit frequency in response to a translation of the positioning device; [See col. 6 lines 19-43, where the frequency is adjustable as needed to encode locations in the direction of patient motion.]["and wherein the transmit frequency is adjusted when a slice selection direction of the image is parallel to an axis of a motion of the subject". [See col. 6 line 19 through col. 7 line 25, especially, col. 7 lines 17-25, where the same process is taught to be applicable to slice selection as well.] The examiner also notes that the **Pelc et al.**, reference also teaches and suggests this limitation for the same reasons given in the response to arguments section above. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, and **18** also apply to **claims 34** and **38**.

48. With respect to **method claim 35**, and **corresponding method claims 39**, which depend respectively from **independent method claim 9**, and **independent method claim 18**; **Hajnal** lacks directly teaching that "the computing of the sub-images acquired from each receiver is offset by a fraction of the field of view, wherein the fraction of the field of view equals the field of view divided by a number of receivers."

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However, **Pelc et al.**, teaches this limitation. [See **Pelc et al.**, col. 2 lines 59-67 ; col. 3 lines 13-29 ; col. 3 lines 37-45; col. 3 line 54 through col. 4 line 3; and especially col. 4 lines 18-33 where in a four coil receiver system the offset for $\Delta Z/Z$ is ~ 0.25 with a 75% efficiency for a given FOV; and see also col. 4 lines 50-65].

49. The examiner notes that it also would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Hajnal** with the teaching of **Pelc et al.**, because as mentioned in the rejection of claim 9, replacing a single coil with a coil array permits the multiple volumes A, B, C, D, to all be acquired within the same scan without a retuning step, when each coil is tuned to a separate frequency, and shortens the overall imaging time which is highly desirable. The same reasons for rejection, obviousness, and motivation to combine, that apply to **claims 9**, and **18** also apply to **claims 35** and **39**.

Prior art of Record

50. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

- A) **Meaney et al.**, US patent 5,924,987 issued July 20th 1999 which teaches obtaining data from the center of k-space for multiple fields-of-view and concatenating in a mosaic fashion the central k-space data to make an overall image.
- B) **Wang et al.**, US patent 5,928, 148 issued July 27th 1999.
- C) **Machida** US patent application publication 2002/0115929 A1 published August 22nd 2002; with an effective filing date of September 21st 2001;
- D) **Kruger et al.**, US patent application publication 2002/0173715 A1 published November 21st 2002, filed November 26th 2001, which teaches a method for acquiring MRI data from a large field-of-view using continuous table motion.
- E) **Brittain et al.**, US patent application publication 2003/0011369 A1 published January 16th 2003, filed September 4th 2002, which teaches a method for acquiring MRI data from a large field-of-view using continuous table motion, and is a **continuation-in-part** of **Brittain 2002/0173715 A1** applied above.
- F) **Brittain** US patent application publication 2004/0155654 A1 published August 12th 2004, filed December 30th 2003, which teaches a method for acquiring MRI

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data from a large field-of-view using continuous table motion, and is a **continuation of Brittain 2002/0173715 A1** applied above.

G) Demoulin et al., US patent application publication 2003/0100825 A1 published May 29th 2003, filed November 21st 2001, which teaches a method and system for extended volume imaging using MRI. The examiner notes that this reference is noted for the purposes of a complete record, but does not constitute prior art against the claims of the instant application because it is applicant's own earlier work, and was filed less than a year before the filing of applicant's instant application.

H) Demoulin et al., US patent 6,584,337 B2 issued June 24th 2003, filed November 21st 2001, which corresponds to **Demoulin et al.**, 2003/0100825 A1 and teaches a method and system for extended volume imaging using MRI. The examiner notes that this reference is noted for the purposes of a complete record, but does not constitute prior art against the claims of the instant application because it is applicant's own earlier work, and was filed less than a year before the filing of applicant's instant application.

I) Zhu et al., US patent application publication 2004/0051529 A1 published March 18th 2004, filed September 12th 2002, which is the publication of applicant's instant application as originally filed. The examiner notes that this reference is noted for the purposes of a complete record, but does not constitute prior art against the claims of the instant application because it is applicant's own work.

J) Brittain US patent application publication 2002/0140423 A1 published October 3rd 2002; with an effective filing date of October 5th 2001. [Note this reference has been **disqualified as prior art based upon the 103(c) prior art exception** because this reference is assigned to the same assignee as the assignee of the instant application.]

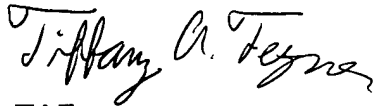
K) Kuhara US patent application publication 2002/0021128 A1 published February 21st 2002, filed April 25th 2001,

Conclusion

51. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 6:00am to 3:30pm.

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52. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF

March 12, 2005


fr Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800